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Sister Mary Joseph's Nodule in Advanced Pancreatic Adenocarcinoma Identified on Hybrid ^{18}F-FDG PET/MR

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Abstract

Sister Mary Joseph's nodule (SMJN) is an umbilical metastatic lesion typically originating from gastrointestinal or gynecological malignancies. In pancreatic cancer, SMJN is a sign of advanced disease with associated poor diagnosis. The novel hybrid **^{18}F-FDG** PET/MRI provides an imaging tool in the identification of SMJN and helps with improved staging of pancreatic cancer.

Introduction: Sister Mary Joseph's nodule (SMJN) refers to a metastatic lesion of the umbilicus with primary malignancy originating from gastrointestinal or genitourinary system. It has been found that pancreatic cancer accounts for 7-9% of the reported SMJN cases with near 90% of tumor occurring at the pancreatic body and tail (*1-2*).

^{18}F-FDG PET/CT has been reported in detection of SMJN given its excellent staging ability (*3*). Here, we describe an SMJN in advanced pancreatic cancer discovered on hybrid ^{18}F-FDG PET/MR. Combining PET molecular imaging and diagnostic abdominal MRI information, PET/MR is a powerful imaging tool in diagnosis and staging pancreatic cancer.

Case Report: A 75-year-old man with biopsy proven pancreatic adenocarcinoma had rising serum tumor biomarker carbohydrate antigen (CA) 19-9 at 41,154 U/mL after one cycle of modified FOLFIRINOX chemotherapy. Diagnostic body CT study performed at an outside institution revealed a new liver metastasis in addition to the known primary pancreatic body tumor. Restaging hybrid ^{18}F-FDG PET/MR, including a torso PET/MR survey scan and focused one-bed position contrast enhanced diagnostic pancreatic PET/MR, was performed to reassess tumor burden. On both torso PET/MR survey and focused diagnostic pancreatic PET/MR images, a 2.3 cm hypermetabolic lesion with MR signal pattern of solid enhancing mass was identified at the retro-umbilical region (**Figure 1 & 2**). In retrospect, this mass lesion was present on abdominal CT image, but was diagnosed as umbilical fungal infection. The patient had been on 6-week antifungal therapy for suspected periumbilical fungal infection, which improved since starting chemotherapy. An ultrasound-guided core biopsy was performed and confirmed metastatic pancreatic adenocarcinoma of umbilicus, also known as, a Sister Mary Joseph's nodule. Based on this proof of disseminated pancreatic cancer, FOLFIRINOX therapy resumed.

Discussion: SMJN represents an umbilical metastatic lesion that typically originates from gastrointestinal and gynecological malignancies. The most common primary sites are stomach (21%), ovary (18%), colon (12%), and pancreas (9%). Other sites of rarer primaries include uterus, biliary tree, breast, and lung (*1-2*). SMJN was named for Sister Mary Joseph, the surgical assistant to Dr. William Mayo of Mayo Clinic. She first noticed the association between an umbilical nodule and advanced intra-abdominal malignancies while preparing the patient's skin before surgery.

The presence of SMJN is a sign of widespread abdominal or pelvic malignancy and usually indicates a poor prognosis (*2*). The tumor markers, including CA 19-9, CEA, and CA 125, should be examined. The mechanism of tumor spread to the umbilicus has been postulated as direct invasion from the peritoneum, through hematogenous or lymphatic pathways, or along the embryonic remnants of the ligamentum teres or umbilical ligaments (*3-4*). In addition to metastasis, the differential diagnosis of a neoplastic umbilical nodule includes primary carcinoma, endometriosis, hernia and granuloma, etc (*5*).

Based on our knowledge, it is the first report of identification of SMJN utilizing PET/MR. The hybrid ^{18}F-FDG PET/MR is superior to PET/CT by providing excellent soft tissue delineation of SMJN on the conjunctive abdominal MRI.

Conclusion: ^{18}F-FDG PET/MR is a novel imaging tool in diagnosis and staging of pancreatic adenocarcinoma. It provides an easier target for biopsy to establish the diagnosis of widespread pancreatic cancer with umbilical metastasis.

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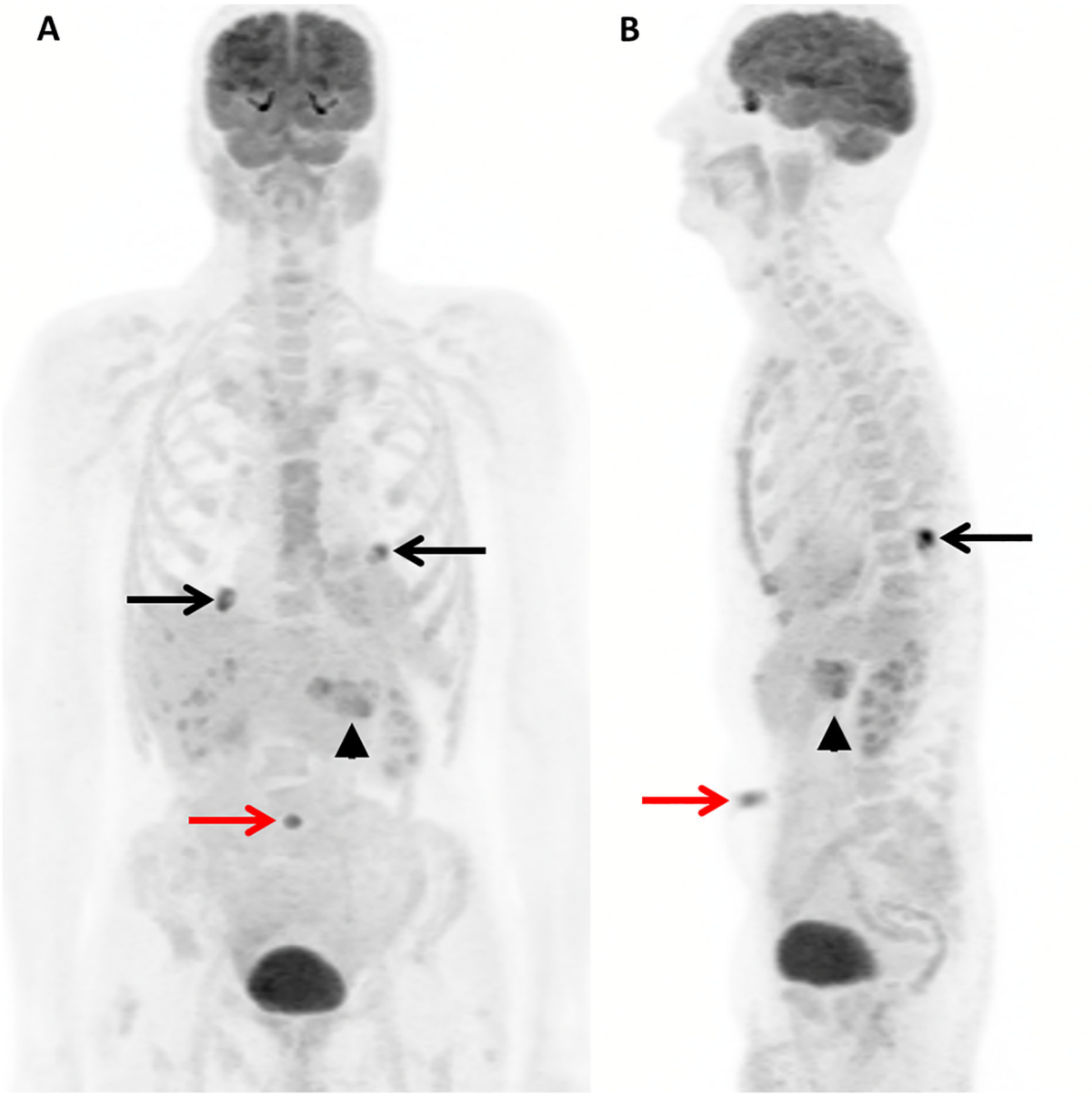

Figure 1. On torso PET/MR survey MIP anterior (A) and lateral (B) views, a tracer-avid lesion at umbilical region (red arrow) with maximum SUV 7.1 and primary pancreatic tumor (black arrow head) with maximum SUV 6.7 were identified. Two additional benign inflammatory lesions were noted in bilateral lung bases (black arrows). The low FDG uptake liver lesion was not discernable on MIP images. MIP: Maximum intensity projection; SUV: standard uptake value.

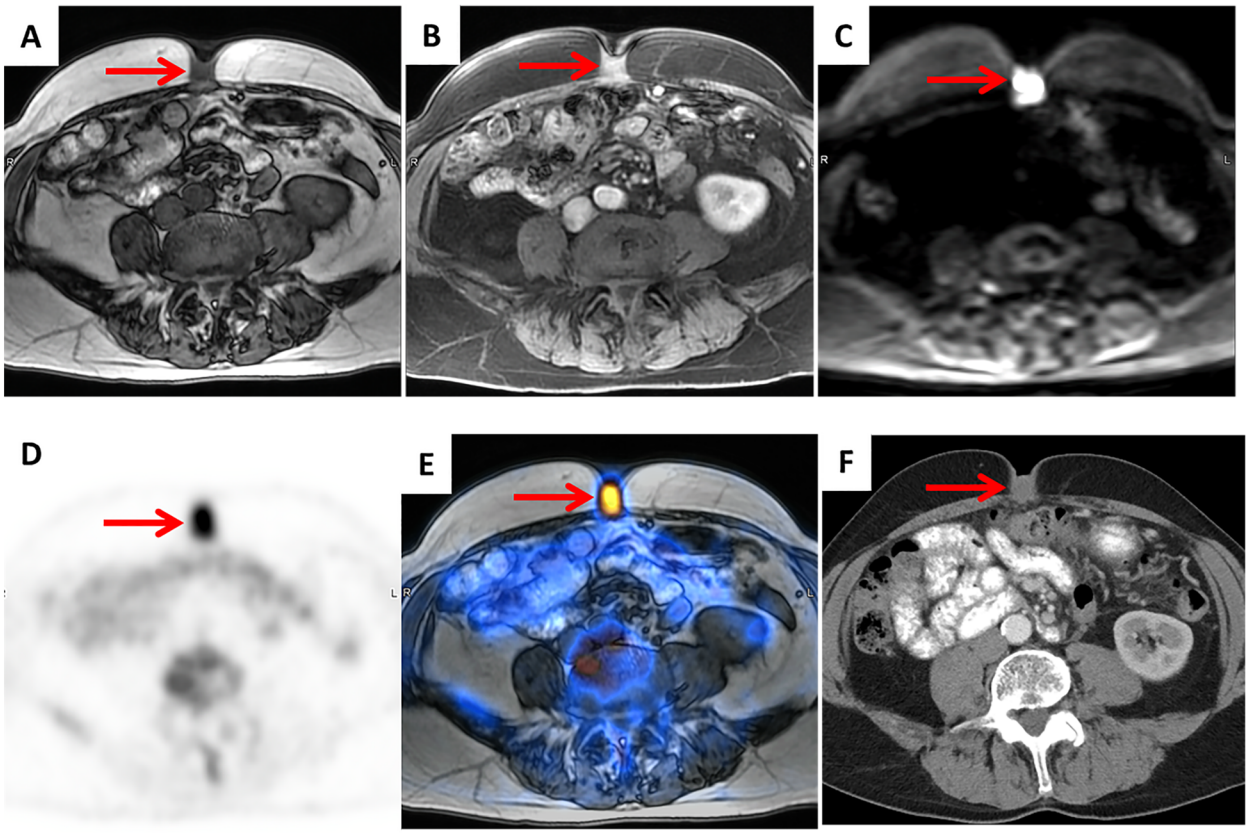

Figure 2. Focused abdominal PET/MRI demonstrated a 2.3 cm lesion (red arrows) with low T1 signal (A), intense enhancement on post contrast image (B), and restricted diffusion on diffusion weighted image (C). It exhibited intense tracer uptake on PET (D) and PET/MR fusion (E) images. This lesion was initially diagnosed clinically as umbilical fungal infection and overlooked on outside contrast enhanced abdominal CT study (F).